Structural trends and basement rock subdivisions in the western Gulf of St. Lawrence: Discussion

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Durling and Marillier (1990) have been able to trace Appalachian structural trends from mainland New Brunswick and Gaspé, Québec to the offshore Gulf of St. Lawrence based mainly on marine seismic data. We would like to comment on their structural correlations in southeastern New Brunswick and Prince Edward Island (Fig. 1) and present an alternate interpretation that we believe is more in accord with stratigraphic, structural, and geophysical evidence.

We agree with Webb (1969) and van de Poll (1983) that the Egmont Bay basement high of Prince Edward Island (P. E. I.) is the continuation of the Indian Mountain horst exposed in the inlier north of Moncton (at G on Fig. 1) in New Brunswick (Gussow, 1953). This correlation is supported by the following: (1) the southeastern side of the Egmont Bay high is characterized by very thick Horton Group clastic rocks and Windsor Group evaporites that are evident in P.E.I. by intersections in Imperial MacDougall and Wellington holes (Webb, 1969), and similarly in New Brunswick by a half-graben of thick Windsor Group evaporites just east of Sussex at Plumweseep and Penobsquis (see Gussow, 1953, sections E-F and G-H; and Howie, 1988, figs. 19, 28, and 31); (2) the southeastern side of the horst is defined by a post-Windsor Group reverse fault (see Durling and Marillier, 1990, fig. 8, section E-F), which in New Brunswick has been called the Petitcodiac-Berry Mills Fault or the Kennebecasis-Berry Mills Fault (Gussow, 1953; Webb, 1963, 1969; St. Peter, 1989); (3) the Indian Mountain horst in New Brunswick has been interpreted from stratigraphic and structural evidence as a transpressive positive flower structure (see Webb, 1963, figs. 9, 12, section A-A'), in agreement with the seismic interpretation of Durling and Marillier (1990) as shown on their figure 8, section E-F. From the foregoing, we would contend that the Indian Mountain horst and Egmont Bay high are a continuous positive transpressive structure bounded on the southeast by the Kennebecasis-Berry Mills Fault and on the northwest by the Smith Creek Fault. Volcanic and intrusive rocks of probable Precambrian age exposed in the Jordan Mountain inlier (F on Fig. 1) and on the Kingston Peninsula, together with those at Indian Mountain, appear to form separate slices of a northeasterly trending strike-slip duplex.

The continuous northeasterly trend of the Precambrian rocks beneath Carboniferous strata is identifiable from both gravity and magnetic trends (Geological Survey of Canada, 1988). We would, therefore, not curve the Belleisle Fault to the east across the trend of the Smith Creek and Kennebecasis-Berry Mills faults as required by the interpretation of Durling and Marillier. Instead, we would maintain a northeasterly strike and, thereby, place the Belleisle Fault on the northern margin of the Horton half-graben in the Cascumpec Basin, analogous to its position north of the Indian Mountain horst in New Brunswick (W. Nickerson, personal communication, 1990). The presence of graphitic slates at a depth of 616 m in a borehole at Buctouche (McMullen, 1920), which are similar to the Ordovician rocks in the Thornes Brook inlier (E on Fig. 1), is consistent with this northeasterly structural trend.

Durling and Marillier (1990) claimed that the northern margin of the pre-Horton Cascumpec basin is bounded by the extension of the Fredericton Fault (see also McCutcheon and Robinson, 1987 and Thomas and Willis, 1989). However, magnetic contours continue to the northeast, well offshore of P.E.I. (Geological Survey of Canada, 1988), suggesting that the Fredericton Fault does not swing to the east-northeast as indicated on figures 1 and 5 of Durling and Marillier (1990). It should also be noted that the placement of a crustal boundary along a curved Fredericton Fault by Thomas and Willis (1989) on the basis of magnetic data did not consider the effect of a granitic pluton intersected in boreholes at Canaan Station and Coal Branch (Fig. 1). Fresh biotites and hornblendes in the chip samples readily distinguish this probable Devonian granite from chloritized granite of Precambrian aspect intersected in boreholes southeast of Moncton. The western part of the pluton is exposed in the inlier at Thornes Brook where the presence of alkali feldspar megacrysts up to 6 cm in length attests to its slow cooling and large areal extent.

The Fredericton Fault in New Brunswick (Fig. 1) is internal to Silurian clastic turbidites of the Fredericton Trough (Fyffe, 1990). These Silurian rocks are known to extend as far east as the Coal Creek inlier (A on Fig. 1) and are likely represented offshore by the pre-Horton strata of the North Point Basin. As the Basswood Ridge-Pendar Brook Fault separates Silurian from Ordovician rocks on the mainland (Fyffe, 1990), we correlate it with the fault through the northwestern tip of P.E.I.

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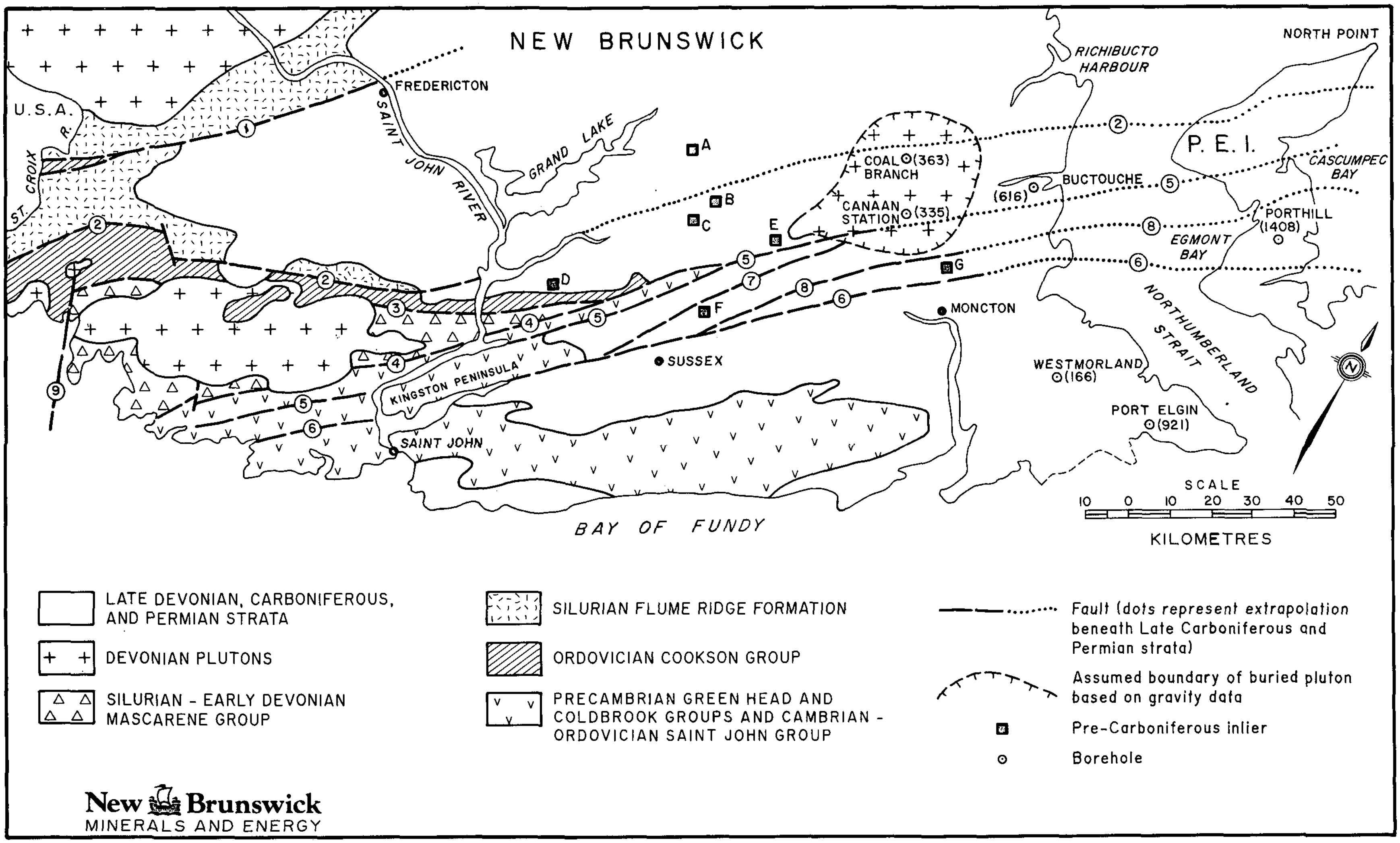

Fig. 1. Geology map of southern New Brunswick and northern Prince Edward Island.
Faults: 1 - Fredericton; 2 - Basswood Ridge-Pendar Brook; 3 - Falls Brook-Taylor Brook; 4 - Wheaton Brook; 5 - Belleisle; 6 - Kennebecasis-Berry Mills; 7 - Jordan Mountain; 8 - Smith Creek; 9 - Oak Bay.
Inliers: A - Coal Creek; B - Forks Stream; C - Canaan River; D - Henderson Brook; E - Thornes Brook; F - Jordan Mountain; G - Indian Mountain.
Boreholes are denoted by their geographic location. Numbers in brackets give depth to basement in metres.

The presence of a strike-slip duplex along the northern margin of the Avalon Terrane in New Brunswick creates a more complicated boundary relationship with the Gander Terrane in comparison to that in Newfoundland. The boundary has variously been placed at the Belleisle Fault (Brown and Helmstaedt, 1970), Wheaton Brook Fault (McCutcheon, 1981), Falls Brook-Taylor Brook Fault (Fyffe and McLeod, 1990; McLeod *et al.*, 1990), and the Fredericton Fault (Williams, 1979). Further detailed isotopic studies such as those of Whalen *et al.* (1989) should help define the elusive Avalon/Gander boundary on the mainland.

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